REMARKS

This application contains claims 1-36. Claims 8, 20 and 32 have been canceled without prejudice. Claims 1, 7, 19, and 31 are hereby amended. No new matter has been added. Claims 1-7, 9-19, 21-31 and 33-36 remain in the application for consideration. Reconsideration is respectfully requested.

The Examiner requested information under 37 CFR 1.105 concerning reference AA in the information disclosure statement (IDS) that was received by the USPTO on June 12, 2002, in this case. Upon investigating this matter, Applicant has determined that the reference submitted with the IDS was actually a copy of U.S. Provisional Patent Application 60/261,539, from which the present application claims priority. A corrected IDS is submitted herewith, removing this reference and adding an article by Eisner entitled "Model Checking the Garbage Collection Mechanism of SMV," along with the requisite publication information. The paper is a case study, presenting the results of an application of the methods of present invention. Since the case study was carried out by Eisner, only she was listed as an author. As noted in the acknowledgements section of the paper on page 10, however, Beer was responsible for the observation that led to the development of the invention.

Claims 7, 19 and 31 were objected to under 37 CFR 1.75(c) for failing to further limit the subject matter of their parent claims. Claims 7, 19 and 31 have accordingly been amended to incorporate the limitations of claims 8, 20 and 32, respectively, which have now been canceled. Applicant respectfully submits that this objective has now been overcome.

Claims 1-12 were rejected under 35 U.S.C. 101 on the grounds of being directed merely to an abstract idea that is not tied to a technological art, environment or machine. Claim 1 has therefore been amended to recite that the method in question is <u>computer-implemented</u>. Thus, claim 1 is now believed to meet the requirements of 35 U.S.C. 101, as are claims 2-12, which depend from claim 1. Applicant respectfully submits that this rejection has been overcome.

Claims 1-11, 13-23 and 25-35 were rejected under 35 U.S.C. 102(b) over Gaboury (U.S. Patent 5,481,717), while claims 12, 24 and 36 were rejected under 35 U.S.C. 103(a) over Gaboury in view of prior art techniques described in the Background section of the present patent application. Applicant respectfully traverses these rejections.

Claim 1 recites a method for verifying software source code that includes the following steps:

1. The source code is processed to derive a set of next-state functions representing the control flow of the code.

2. References to the program variables in the next-state functions are replaced with non-deterministic choices.

3. The next-state functions (with the non-deterministic choices) are restricted to produce a finite-state model of the control flow.

4. The finite-state model is verified.

Gaboury describes a method for program verification by comparing parametrized logic programs (abstract). In the embodiments described by

Gaboury, "a logic program... is a sentence
formed from a set of definite clauses" (col. 5,
lines 24-25). A definite cause is a certain
type of logical formula taken over variables
$V_1,...,V_n$, indicating relations among the
variables (col. 5, lines 5-23). In other
words, a "logic program," as defined by
Gaboury, is simply a collection of logical
conditions that are applied to certain
variables. Gaboury illustrates his method with
reference to an example of a query and a logic
program defining the operation of a stack (col.
5, lines 48-50, and Fig. 2).

In this sort of logic program, there is no defined
order to the clauses, and thus there is no "control flow." By
contrast, software source code conventionally consists of a
sequence of commands or instructions. The control flow of the
code (as illustrated in the present patent application in
Tables I and II), is a representation of the sequence of
actions that take place in the execution of the program.
Since Gaboury's logic program is made up of conditions, rather
than instructions, it has no meaningful control flow. In the
absence of such a control flow, Gaboury cannot be taken to
teach the step of deriving a set of next-state functions
representing the control flow, as recited in claim 1.

The second step of claim 1 requires that references
to the program variables in the next-state functions be
replaced with non-deterministic choices. This operation is
illustrated by way of example in Table III of the present
patent application, from which the program variable a has been
abstracted out. The Examiner identified the next-state

functions recited in claim 1 with Gaboury's FSM. Assuming, for the sake of argument, that this identification is correct, Gaboury's program variables would have to be replaced with non-deterministic choices in the FSM in order to meet the requirement of claim 1. Gaboury's FSM, however, preserves the program variables $V_1, \ldots, V_n$ even in its completed (reduced) form (col. 8, lines 35-41, and see also Fig. 8). The fact that Gaboury adds in type variables (col. 7, lines 37-41, cited by the Examiner in reference to this claim step) just reinforces the conclusion that <u>Gaboury does not abstract out any program variables from his FSM</u>, in distinction to the requirement of claim 1.

Thus, Applicant respectfully submits that Gaboury does not teach all the limitations of claim 1, and that claim 1 is therefore patentable over the cited art. In view of the patentability of claim 1, claims 2-12, which depend from claim 1, are also believed to be patentable.

Independent claims 13 and 25 respectively recite an apparatus and a computer software product that operate on principles similar to the method of claim 1. These claims were rejected on the same grounds as claim 1. Therefore, for the reasons stated above, claims 13 and 25 and believed to be patentable over the cited art, as are dependent claims 14-24 and 26-36.

Notwithstanding the patentability of the independent claims, the dependent claims in this application are also believed to recite subject matter that is independently patentable. Applicant will refrain, for the sake of brevity, from arguing the patentability of all the dependent claims, but two representative examples will be presented below:

Claim 2 depends from claim 1 and adds the limitation that the source code is processed to extract a program counter, which is used in expressing the next-state functions. The program counter indicates the sequence of execution steps in the source code, as illustrated, for example, by the numbered lines in Table I of the present patent application. The program counter (pc) values are then used in constructing the next-state function in Table II. In relation to claim 2, the Examiner maintained that this sort of extraction and use of a program counter is analogous to Gaboury's encoding of the states of the FSM (col. 11, lines 34-38). Gaboury shows the result of this step in Fig. 16 (col. 11, lines 48-50). It can be seen plainly in this figure that the encoded FSM makes no use whatsoever of the line numbers in Fig. 2 (Gaboury's "source code") or in Fig. 8 (the FSM itself), or of any other element that could be considered a "counter" extracted from the source code, as required by claim 2. Therefore, claim 2 is believed to be independently patentable over the cited art.

Claim 5 depends from claim 1 and adds the limitation that the references to the program variables are eliminated from the next-state functions, so that the finite-state model of the control flow is substantially independent of data values of the program variables. As noted earlier, Gaboury's FSM preserves the program variables. The persistence of the program variables V1 and V2 can be seen in the "completed form" of Gaboury's "canonical FSM" that is shown in his Fig. 8 (see col. 8, lines 43-45). In other words, Gaboury's FSM is dependent on the data values of the program variables. Thus, claim 5 is believed to be independently patentable over the cited art.

Applicant has studied the additional references cited by the Examiner and believes all the claims in the present patent application to be patentable over these references, whether taken individually or in any combination.

Applicant believes the amendments and remarks presented hereinabove to be fully responsive to all of the grounds of rejection raised by the Examiner. In view of these amendments and remarks, Applicant respectfully submits that all of the claims in the present application are in order for allowance. Notice to this effect is hereby requested.
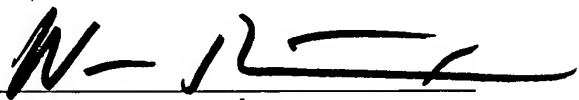
Acknowledgement by the PTO of the receipt of applicants' papers filed under Section 119 is noted.

The prior art documents made of record and not relied upon have been noted along with the implication that such documents are deemed by the PTO to be insufficiently pertinent to warrant their applications against any of applicant's claims.

Favorable reconsideration and allowance are earnestly solicited.

Respectfully submitted,

BROWDY AND NEIMARK, P.L.L.C.
Attorneys for Applicant(s)

By _____
Norman J. Latker
Registration No. 19,963

NJL:srd
Telephone No.: (202) 628-5197
Facsimile No.: (202) 737-3528
G:\BN\C\colb\Beer4\PTO\AMD 15 JUN 05.doc

- 15 -